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Comparative analysis of surgical outcomes: post-ERCP laparoscopic cholecystectomy versus elective laparoscopic cholecystectomy

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ABSTRACT

Aims: Gallstones are widespread in the adult population. In some patients, the stones are not confined to the gallbladder but are also found in the biliary tract. Although the treatment approach for this group of patients is controversial, the most widely accepted treatment is laparoscopic cholecystectomy (LC) after removal of the stones by endoscopic retrograde cholangiopancreaticography (ERCP). Opinions differ as to whether LC should be performed early or late. With this study, we wanted to shed light on this question based on our own clinical experience.

Methods: A total of 100 patients who underwent LC in our clinic were included in the study. These patients were divided into two groups; 50 patients who underwent ERCP and early cholecystectomy (group 1) and 50 patients who underwent elective LC for gallstones (group 2). Patients who underwent ERCP for malignant or benign stricture, patients with porcelain sac, patients with previous abdominal surgery, patients who underwent emergency LC, patients younger than 18 years old, and patients with incomplete data, incomplete records, or patients whose necessary information could not be accessed were excluded.

Results: There was no statistically significant difference between age and preoperative amylase levels. The mean length of hospital stay was 3.9±1.6 days in patients who underwent elective LC and 5.5±3.2 days in patients who underwent LC after ERCP. There was a statistically significant difference between postoperative amylase level, hemoglobin level and length of hospital stay ($p<0.05$). Postoperative amylase levels and length of hospital stay were higher in group 1. There was a significant difference between the groups in terms of surgical procedure ($p<0.05$). In group 1, laparoscopic cholecystectomy (LC) was performed in 78% of patients, while in group 2, LC was performed in 94% of patients. It was found that the rate of conversion to patency was higher in group 1. There was no statistically significant difference between the groups in terms of postoperative and preoperative complications

Conclusion: Our study highlights early cholecystectomy after ERCP to reduce potential complications in the treatment of gallstones, while emphasising the need for close patient follow-up and further research validation.

Keywords: Post-ERCP laparoscopic cholecystectomy, elective laparoscopic cholecystectomy, ERCP, cholecystectomy, gallbladder stone, bile duct stone

INTRODUCTION

Gallstones occur in 10% of the adult population. Choledochal stones are also found in 4-15% of patients.[1] Endoscopic retrograde cholangiopancreatography (ERCP) is an important examination and treatment procedure for diseases of the biliary tract and pancreas. However, ERCP-related procedures have a high risk of adverse events (AEs) such as post-ERCP pancreatitis (PEP), bleeding, perforation and cholangitis. PEP is the most important complication because it can be fatal in severe cases. Although the incidence of PEP has been reported as 1.6-15% in some studies, recent systematic reviews have reported an incidence of 3.47% [95% confidence interval (CI): 3.19-3.75%] and a mortality rate of 0.11%.[1-5] In patients with cholelithiasis associated with choledochal calculi, the most accepted treatment approach by most clinicians today is to first remove the stone obstructing the duct with endoscopic retrograde cholangiopancreaticography

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(ERCP) and then perform laparoscopic cholecystectomy (LC).[1,2] There is no consensus on the timing of LC after ERCP, with some surgeons advocating early surgery and others advocating late surgery.[3] There is also a view that the more time that passes after ERCP until surgery, the more biliary complications occur.[4,5] ERCP is the standard of care for the treatment of choledocholithiasis; however, it carries the risk of complications that can result in significant morbidity and mortality. While current guidelines support the use of ERCP for the treatment of symptomatic bile duct stones, the need for ERCP in incidentally found asymptomatic choledocholithiasis is more controversial.[6-9]

In our clinic, we perform early LC because complications such as acute cholecystitis, choledocholithiasis, biliary pancreatitis, and cholangitis may occur while waiting for surgery after ERCP. In this study, we compared LC cases in which surgery was decided after ERCP with elective LC cases in our clinic.

METHODS

Ethics

The thesis study was initiated with the approval of the Afyonkarahisar Health Sciences University Medical Faculty Clinical Researches Ethics Committee (Date: 18.12.2014, Decision No: 277). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Patient Selection

A total of 100 patients admitted to Department of General Surgery, Afyonkarahisar Health Sciences University University Faculty of Medicine Hospital between 01.01.2013 and 31.12.2013 were included in this retrospective study.

Inclusion criteria: Patients with biliary tract pathology with gallstones who underwent early LC after ERCP and patients who underwent elective LC for gallstones who underwent ERCP were included in the study. Patients with at least one abdominal imaging report (USG, MRI and MRCP, CT) and recent laboratory results performed before ERCP and adult patients over 18 years of age were included in the study.

Exclusion criteria: Patients without at least one abdominal imaging report performed before ERCP, patients undergoing ERCP for malignant or benign stricture, patients with porcelain sac, patients with previous abdominal surgery, patients undergoing emergency LC, patients younger than 18 years of age, and patients with incomplete data, incomplete files, or patients whose necessary information could not be accessed were excluded.

Grouping of Cases

Patients with biliary tract pathology with gallstones who underwent early LC (24-72 hours) after ERCP were included in group 1. Patients who underwent elective LC due to gallbladder stones with indication in outpatient clinics and wards were included in group 2. All ERCP procedures were performed in the same department and by a single endoscopist. Age, gender, body mass index (BMI), postoperative hemoglobin levels, amylase levels, complications, peroperative complications, surgical interventions after conversion to open surgery, and length of hospital stay were retrospectively evaluated in these two groups.

Statistical Analysis

SPSS 19.0 statistical package program was used for data analysis. Descriptive statistical methods (frequency, percentage, mean, standard deviation) and Pearson Chi-square, Fisher Chi-square or Yates Chi-square tests were used to compare quantitative data. The conformity of the data to normal distribution was performed with the Kolmogorov-Smirnow test. In the study, independent samples-t test was used in the evaluation of quantitative data showing normal distribution; values less than p=0.05 were considered significant and significant difference between groups.

RESULTS

Demographic data and laboratory results of group 1 are given in Tables 1, 2.

Table 1. Mean data of post-ERCP cholecystectomy patients

	Post-ERCP cholecystectomy (n=50)
	Mean±SD
Age (year)	57.8±18.5
BMI (kg/m^2)	30.1±5.8
Amylase (U/L)	100.6±214.4
Icterus (mg/dl)	3.3±3.0
Choledochal diamater (mm)	11.2±4.5
Post-ERCP icterus	2.9±3.0
Post-ERCP amylase (U/L)	331.9±518.5
Post-ERCP leucocytosis leucocytosis (x10^3/mm^3)	10.5±4.2
Postoperative amylase (U/L)	160.4±197.9
Postoperative hemoglobin (g/dl)	11.4±1.6
Postoperative leucocytosis (x10^3/mm^3)	10.2±4.2
Length of hospital stay (day)	5.5±3.2

ERCP: Endoscopic retrograde cholangiopancreatography, BMI: Body-mass index, SD: Standart deviation

Demographic data and laboratory results of group 2 are given in Tables 3, 4.

There was no statistically significant difference between the groups in terms of gender, BMI and American Society of Anesthesiologists (ASA) score. Although there was no statistical difference between the age groups, the number of patients aged ≥70 years was higher in the elective cholecystectomy group (82% and 64%, respectively). LC was performed in 76% of patients in group 1, while 94% of patients in group 2 (p<0.05). The rate of conversion to open surgery was higher in group 1 than in group 2 (12 and 3 patients, respectively) (Tables 2, 4).

There was no statistically significant difference between age and preoperative amylase levels. The mean length of hospital stay was 3.9±1.6 days in group 2 and 5.5±3.2 days in group 2. There was a statistically significant difference between postoperative amylase level, postoperative hemoglobin level and length of hospital stay (p<0.05). Postoperative amylase level and length of hospitalization were higher in group 1 (Table 5).

Table 2. Demographic and clinical/laboratory data of post-ERCP cholecystectomy patients		
Gender		**%**
Female		52.0
Male		48.0
Age group		
Year <70		64.0
Year >70		36.0
BMI		
Normal		20.0
Overweight		30.0
Obese		50.0
ERCP endication		
Cholangitis		16.0
Choledochal stone		72.0
Pancreatitis		12.0
Icterus		
<2		44.0
2-5		32.0
>5		24.0
Elevated liver function test		
No		6.0
Yes		94.0
Lococytosis		
No	31	62.0
Yes	19	38.0
ASA score		
ASA 1	18	36.0
ASA 2	13	26.0
ASA 3	15	30.0
ASA 4	4	8.0
Presence of stones on pre-ERCP imaging		
No	20	40.0
Yes	30	60.0
Choledochal diameter (mm)	**n**	**%**
<10	17	34.0
10-15	28	56.0
>15	5	10.0
Stent application		
No	29	58.0
Yes	21	42.0
Standard sphincterotomy		
No	20	40.0
Yes	30	60.0
Balloon application		
No	6	12.0
Yes	44	88.0
Precut sphincterotomy		
No	30	60.0
Yes	20	40.0
ERCP procedure complication		
No	46	92.0
Bleeding	2	4.0
Perforation	1	2.0
Respiratory failure	1	2.0
Papilla		
Normal	22	44.0
Atrophic	15	30.0
Edematous	10	20.0
Atrophic-edematous	3	6.0

Table 2. Demographic and clinical/laboratory data of post-ERCP cholecystectomy patients (continues)		
Diverticulum		
No	44	88.0
Yes	6	12.0
Stone extraction		
No	20	40.0
Yes	30	60.0
Pancreas canulaton		
No	41	82.0
Yes	9	18.0
	Post-ERCP cholecystectomy (n=50)	
Failed cannulation	**n**	**%**
No	48	96.0
Patients' intolerance	1	2.0
Premedication	1	2.0
Post-ERCP complication		
No	26	52.0
Cholangitis	8	16.0
Pancreatitis	16	32.0
Surgery performed		
Open cholecystectomy, choledochal exploration, primary repair	2	4.0
Open cholecystectomy, choledochal exploration and tube application	3	6.0
Laparoscopic-onset open cholecystectomy	7	14.0
Laparoscopic cholecystectomy	38	76.0
Postoperative complication		
No	40	80.0
Postoperative bleeding	2	4.0
Gastroparasia	2	4.0
Bile leakage	3	6.0
Wound site infection	3	6.0
Peroperative complication		
No	33	66.0
Gallbladder perforation	8	16.0
Bed hemorrhage	5	10.0
Biliary tract injury	1	2.0
Vascular bleeding	3	6.0
Oddi disfunctions		
No	45	90.0
Yes	5	10.0
Difficult cannulation		
No	46	92.0
Yes	4	8.0
Reason for switching to open surgery		
No	39	78.0
Gallbladder injury	1	2.0
Vascular bleeding	3	6.0
Adhesion	7	14.0

ERCP: Endoscopic retrograde cholangiopancreatography, BMI: Body-mass index, ASA: American Society of Anesthesiologist

Table 3. Data of patients undergoing elective cholecystectomy	
	Cholecystectomy (n=50)
	Mean±SD
Age **(year)**	56.3±14.7
BMI (kg/m^2)	27.8±3.9
Amylase (U/L)	84.6±202.7
Postoperative amylase (U/L)	73.8±66.8
Postoperative hemoglobin gr/dl	13.1±1.4
Length of hospitalization (day)	3.9±1.6

SD: Standart deviation, BMI: Body mass index

Table 4. Data of patients undergoing elective cholecystectomy

	Cholecystectomy (n=50)	
Gender	**n**	**%**
Female	28	56.0
Male	22	44.0
Age group	**n**	**%**
Age <70	41	82.0
Age ≥70	9	18.0
BMI		
Normal	12	24.0
Overweight	19	38.0
Obese	19	38.0
Operation in the past		
No	50	100.0
Preoperative diagnosis		
Cholelytiasis	50	100.0
Elevation of liver function tests		
No	24	48.0
Yes	26	52.0
Leukocytosis		
No	21	42.0
Yes	29	58.0
ASA score		
ASA 1	17	34.0
ASA 2	21	42.0
ASA 3	10	20.0
ASA 4	2	4.0
Surgery performed		
Open cholecystectomy with laparoscopic onset	3	6.0
Laparoscopic cholecystectomy	47	94.0
Postoperative complications	**n**	**%**
No	40	80.0
Bleeding at the drain site	2	4.0
Gastroparesis	1	2.0
Bile leakage	2	4.0
Wound site infection	3	6.0
Abscess in the sac lodge	1	2.0
Biliary tract injury	1	2.0
Peroperative complication		
No	36	72.0
Gallbladder perforation	7	14.0
Site hemorrhage	5	10.0
Reason for switching to open surgery		
No	47	94.0
Vascular bleeding	1	2.0
Adhesion	2	4.0

BMI: Body-mass index, ASA: American Society of Anesthesiologist

Table 5. Comparison of amylase levels and length of hospital stay between groups

	Post-ERCP cholecystectomy (n=50)	Cholecystectomy (n=50)	
	Mean±SD	**Mean±SD**	**p**
Age (year)	57.8±18.5	56.3±14.7	0.664
Amylase (U/L)	100.6±214.4	84.6±202.7	0.703
Postoperative amylase (U/L)	160.4±197.9	73.8±66.8	0.005
Length of hospital stay (day)	5.5±3.2	3.9±1.6	0.002

ERCP: Endoscopic retrograde cholangiopancreatography, SD: Standart deviation

There was no statistically significant difference between the groups in terms of postoperative ERCP complications and postoperative complications related to age, gender, BMI, choledochal diameter, stenting, ASA scores, leukocyte level, KCFT level and type of surgery performed (p>0.05).

There was no statistically significant difference between group 1 and the group 2 in terms of postoperative complications (p>0.05) (Table 6).

Table 6. Comparison between groups in terms of postoperative complications

	Post-ERCP cholecystectomy (n=50)		Cholecystectomy (n=50)		
Postoperative complication	**n**	**%**	**n**	**%**	**p**
No	40	80.0	40	80.0	0.865
Bleeding at the drain site	2	4.0	2	4.0	
Gastroparasia	2	4.0	1	2.0	
Bile leakage	3	6.0	2	4.0	
Wound site infection	3	6.0	3	6.0	
Abscess in the sac lodge	--	--	1	2.0	
Biliary tract injury	--	--	1	2.0	

ERCP: Endoscopic retrograde cholangiopancreatography

There is also a statistically significant difference in terms of bile duct injury, vascular bleeding, adhesions (p >0.05). There was no statistically significant difference between the groups in terms of age, gender, BMI, choledochal diameter, stenting, ASA scores, leukocyte level, KCFT level, type of surgery performed in terms of postoperative ERCP complications and postoperative complications (p>0.05).

In the Precut Sphincterotomy-complications comparison, it was found that there was no statistically significant difference between ERCP procedure complications and postoperative complications and precut sphincterotomy (p >0.05), while there was a statistically significant difference between post-ERCP complications and precut sphincterotomy (p <0.05). While 33.3% of patients without precut sphincterotomy developed post-ERCP complications, 70.0% of patients with precut sphincterotomy developed post-ERCP complications. In other words, the rate of post-ERCP complications was found to be higher in patients who underwent precut sphincterotomy.

In the stone extraction-complication comparison, it was found that there was no statistically significant difference between ERCP procedure complication, post-ERCP complication and postoperative complications and stone extraction (p>0.05).

In the liver function tests elevation-complication comparison; it was found that there was no statistically significant difference between ERCP procedure complication, post-ERCP complication and postoperative complications and Liver function tests elevation (p>0.05).

In the pancreatic cannulation-complication comparison, it was found that there was no statistically significant difference between ERCP procedure complication and postoperative complications and pancreatic cannulation (p>0.05), while there was a statistically significant difference between post-ERCP complication and pancreatic cannulation (p<0.05). While 41.5% of patients without pancreatic cannulation developed Post-ERCP Complications, 77.8% of patients with pancreatic cannulation had a higher rate of Post-ERCP complications.

In the comparison of oddi dysfunction-complication; it was found that there was no statistically significant difference between ERCP procedure complication and postoperative complications and oddi dysfunction (p >0.05), while there was a statistically significant difference between post-ERCP complication and oddi dysfunction (p <0.05). Post-ERCP complications did not develop in 53.3% of patients with oddi dysfunction no, while 20% of patients with oddi dysfunction yes did not develop post-ERCP complications. In other words, it was found that the rate of post-ERCP complications was higher in patients with oddi dysfunction.

In terms of perioperative complications, none of the patients who underwent open cholecystectomy, choledochal exploration, and primary repair developed complications, while peroperative complications developed in all patients who underwent open cholecystectomy, choledochal exploration, and t-tube application, 57.1% of patients who underwent laparoscopic-onset open cholecystectomy, and 23.7% of patients who underwent LC.

In terms of perioperative complications, postoperative complications developed in 100% of patients who underwent open cholecystectomy, choledochal exploration and primary repair, 100% of patients who underwent open cholecystectomy, choledochal exploration and t-tube application, 14.3% of patients who underwent open cholecystectomy with laparoscopic onset and 10.5% of patients who underwent LC.

In the age group-complication comparison, it was found that there was no statistically significant difference between the age groups in terms of postoperative complications (p>0.05), while in terms of preoperative complications, 22% of patients younger than 70 years of age had preoperative complications, while patients aged 70 years and older had more preoperative complications (55.6%) (p<0.05).

DISCUSSION

In our study, the rate of conversion to open surgery in elective LC patients was 6%. This result was in accordance with the data of similar studies in the literature.[10,12-15] In our study, the rate of conversion to open surgery in LC's performed after ERCP was 22%. Laparoscopic operations may require conversion to open surgery for many reasons.[6] Different rates of conversion to open surgery are given in series (2%-14%).[7-15] Open surgery is performed early to avoid biliary tract injury due to forced cholecystectomy secondary to adhesions. This was thought to be the reason why our rate of conversion to open surgery was higher than the literature.

In the study by Stefanova et al.[11] 216 patients were included. The median age was 76 years (interquartile range 70-83). Most patients (80%, n=172) had mild pancreatitis and 12% (n=26) had severe disease. 24% (n=55) were treated with ERCP-sphincterotomy (ERCP-s); 40% (n=87) underwent LC alone; 11% (n=23) underwent ERCP-s followed by LC; and 25% (n=55) had no intervention. Patients without intervention were older (p<0.001) and more frail (p<0.001). Post-procedural readmission rates were lowest in the LC-only group with 6% (n=5) compared with 27% (n=14) for ERCP-s, 33% (n=7) for ERCP+LC and 31% (n=17) for the no intervention group (p=0.0001). Biliary-related mortality was highest in the non-intervention group (n=11, 20%). In our study, the lowest rates (in terms of conversion to open surgery and development of complications) were seen in those who underwent elective LC.

We found a statistically significant difference between the groups of patients who underwent elective LC and LC after ERCP in terms of postoperative amylase (100.6±214.4 U/L; 84.6±202.7 U/L, respectively) and length of hospital stay (5.5±3.2; 3.9±1.6 days, respectively). It was thought that this may be due to the reduction in the severity of cholecystitis after ERCP with relief of obstruction and decrease in inflammation.

In our study, the preoperative minor complication rate in group 1 patients was 26% and no major complications were observed. In group 2 patients, the per-operative minor complication rate was 28% and the major complication rate was 8%. The most common per-operative complication in both groups was gallbladder perforation and spillage of bile and gallstones into the peritoneal cavity. Another complication was leaking hemorrhages from the liver bed. There was no statistically significant difference between group 1 and group 2 patients in terms of per-operative complications.

In the literature, peroperative complications that can be corrected with simple surgical intervention, such as lung flushing after gallbladder perforation, cleaning stones that fall into the abdominal cavity, and using coagulation systems for bleeding from the liver bed, are called minor complications.[7,8,16-18] Unstoppable bleeding from the liver bed, major vessel injuries, luminal organ injuries, and biliary tract injuries are defined as major complications.[19-23] The preoperative minor and major complication rates are quite variable in the literature.[18-25] In our study, bile leakage and wound infection were the most common postoperative complications. When we evaluated group 1 and group 2 patients, there was no statistically significant difference in postoperative complications.

Difficult cannulation has been seen as a risk for complications after ERCP in many studies.[1,14,18] Repetitive trauma to the papilla and pancreatic sphincter is thought to play a role in the development of pancreatitis by disruption of pancreatic drainage by developing edema in the early period and stricture in the late period. The numbers of pancreatitis development according to the number of attempts of papilla cannulation are variable. Freeman et al.[16] determined this value as 6 in their study. One should not insist on attempting difficult cannulation because complications increase after

repeated cannulation due to mechanical damage caused by pancreatic and biliary tract instrumentation, hydrostatic damage after excessive injection, chemical and allergic damage caused by contrast material, enzymatic damage caused by intestinal contents, infection, and thermal damage. In our study, more than 3 repeated cannulation attempts in ERCP were termed as difficult cannulation and it was seen in 4 patients (8%).[16,18-20] The presence of diverticulum was detected in 2 patients and atrophic papilla was detected in the other patients as the cause of difficult cannulation. One patient developed pancreatitis and one patient developed cholangitis after difficult cannulation. In our study groups, the complication rate was 50% in both groups with and without difficult cannulation and the results were not statistically significant.[18-20]

Guidewire advancement into the pancreatic duct plays a role in the development of pancreatitis with mechanical damage. Lee et al.[17] reported in their prospective study that unintentional pancreatic cannulation played a role in the development of pancreatitis. In the study, complications developed in 6 (5.5%) of 106 patients without pancreatic cannulation, while complications developed in 20 (25.3%) of 79 patients with pancreatic cannulation. In our study, while the complication rate after ERCP was 41.5% in patients without pancreatic cannulation, this rate increased to 77.8% after unintentional pancreatic cannulation. These results are statistically significant ($p<0.048$).

Precut papillatomy refers to several endoscopic techniques used to access the bile duct (or pancreatic duct). Precut techniques are often used after failure of conventional methods of biliary cannulation. The reported complication rate due to endoscopic precut sphincterotomy is 6.9-9.8%.[16-20] In our study, it was shown that precut with needle-tipped sphincterotomy increased the development of complications ($p<0.05$).

The complication (cholangitis, cholecystitis, duodenal perforation, bleeding, pancreatitis, proximal and distal bile duct migration and recurrent biliary obstructions) rate after biliary stenting in ERCP varies between 8-10%. Due to long-term use of stents, duodenal wall necrosis and perforation may develop after pressure of the intradouodenal part of the stent on the duodenal wall. In patients without biliary stenting, 37.9% of patients had complications after ERCP; this rate increased to 61.9% in patients with stenting. In our study, stenting was performed 42% of the time, 32% for therapeutic and 10% for prophylactic purposes. Prophylactic plastic stent placement may increase the risk of complications in cases where stone removal from the bile duct is inadequate or unsuccessful. Consistent with the literature, stent placement increased the complication rate after ERCP in our patients.[1,7-11,15-20]

In our study, OSD was detected in 10% of the patients who underwent ERCP; while the post-ERCP complication rate was 46.7% in patients without OSD, this rate increased to 80% in patients with OSD. It was observed that the increase in post-ERCP complication rates in patients with OSD was consistent with the literature ($p<0.05$).

In our study, 32% of patients developed acute pancreatitis after ERCP, which is higher than the reported rates. We think that this rate is high due to the limited number of patients, the selection of a non-homogeneous patient group, and the presence of gallbladder stones along with biliary tract stones in the patients. Transient pancreatic enzyme elevation after ERCP is a common condition. In the literatüre, the frequency of hyperamylasemia after ERCP is reported to be between 25-75%.[1,7,10,15-21] In our study, the post-procedural amylase values of patients who underwent laparoscopic cholecystectomy after ERCP were 160.4±197.9U/L and hyperamylasemia was found in 44% of patients who underwent ERCP.

Cholangitis occurs in 0.4-1.8% of patients undergoing ERCP.[7,10,18,20,21] The most common infectious complication of ERCP is ascending cholangitis. It is defined as a clinical syndrome characterized by fever, jaundice and abdominal pain as a result of bile duct stasis and infection. It frequently occurs after ERCP as a result of inadequate drainage of the infected and obstructed biliary system. In our study, 8 (16%) patients developed acute cholangitis and this rate is above the limits given in the literature. All of the patients were diagnosed with obstructive icterus with different levels of elevated bilirubin levels before ERCP. These patients were considered to have cholangitis after the ERCP procedure because of procedure-related abdominal pain, elevated bilirubin levels and leukocytosis. Patients with elevated bilirubin levels before the procedure have an increased risk of concomitant ascending infection and increased complications after ERCP. In our study, abdominal tenderness with the smallest increase in the initially high bilirubin level after ERCP was accepted as a complication of cholangitis. Therefore, we think that the complication of acute cholangitis after ERCP is higher than the literature.

Although there is no consensus in the literature on when to perform ERCP, preoperative ERCP followed by laparoscopic cholecystectomy is the widely accepted method.[10,17,20-23] The effects of ERCP on the severity of cholecystitis and the technical difficulty of subsequent laparoscopic cholecystectomy are still debated. However, the opposing view is that ERCP may have a palliative effect on cholecystitis and indirectly on laparoscopic cholecystectomy because it provides source control by removing the bile duct stone and evacuates the gallbladder when the cystic duct is open.[24-30]

If stones in the common bile duct have not been reduced by ERCP and residual stones are suspected, the bile duct should be explored laparoscopically or openly. Although laparoscopic bile duct exploration is more popular these days, it is not practiced by many surgeons. Long operative time, special techniques, high morbidity and the risk of incomplete removal of stones detract from laparoscopic surgery. Therefore, open choledochal exploration is still widely used. It should be kept in mind that primary choledochal closure has been found to be safe in most of the studies in which choledochal exploration has been performed, but its prevalence is lower than that of t-tube. However, although the t-tube is widely used, its follow-up may pose some problems for surgeons and patients.[31-36]

Laparoscopic operations may require conversion to open surgery for various reasons. Different rates for conversion to open surgery are given in various series. Akın et al.[37] reported that 8.1% of 192 patients, Alabaz et al.[38] reported that 11% of 192 patients, and Ağalar et al.[39] reported that 6% of 500 patients started laparoscopic operation and switched to open surgery for various reasons. In our study, the rate of conversion to open surgery in elective laparoscopic cholecystectomy

patients was 6%. This result was in accordance with the literature. In our study, the rate of conversion to open surgery was 22% in laparoscopic cholecystectomies performed after ERCP. Open surgery was performed early to avoid bile duct injury due to forced cholecystectomy secondary to adhesions. Therefore, our rate of conversion to open surgery is higher than the literature.

The most common postoperative complications in our study were bile leakage and wound infection. Other postoperative complications were bleeding from the incision site, hiccups, gastroparesis, and hematoma in the pouch lumen. There was no statistically significant difference in postoperative complications between group 1 and group 2 patients ($p<0.865$). In general, there was no difference between the groups when the presence of complications was compared, but abscess development in the gallbladder lumen and biliary tract injury were found more frequently in group 1 patients.

Limitations

The retrospective design of the study is our most important limitation. In addition, although 100 patients were not few, the number of patients remained small in subgroups due to the fact that the patients were divided into many subgroups due to the distribution of post-procedures and complications; therefore, a larger number of patients for such frequent operations would provide more valuable data.

CONCLUSION

It is important to correctly determine the indication for an ERCP, to be aware of possible complications and to avoid unnecessary procedures that can lead to complications. We believe that appropriate treatment should be initiated for any complication that occurs during or after ERCP and that close follow-up of the patient after ERCP is necessary. Each patient should be evaluated individually and physicians should determine the appropriate method according to demographic, clinical and laboratory findings. The experience of the team performing the procedure is also very important in choosing the method. We believe that early cholecystectomy is more appropriate before complications occur after ERCP.

ETHICAL DECLARATIONS

Ethics Committee Approval

This thesis study was initiated with the approval of Afyonkarahisar Health Sciences University Medical Faculty Clinical Researches Ethics Committee (Date: 18.12.2014, Decision No: 277).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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